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FLOOD INSURANCE STUDY

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CITY OF O'FALLON, MISSOURI

ST. CHARLES COUNTY

SEPTEMBER 16, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 290316

FEM 1.209

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

CITY OF O'FALLON,
ST. CHARLES COUNTY, MISSOURI

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of O'Fallon, St. Charles County, Missouri, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of O'Fallon to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, St. Louis District, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-10-77, Project Order No. 19, Amendment No. 2. This study was completed in August 1979.

1.3 Coordination

At the request of the Consultation Coordination Officer (CCO), appointed by the Federal Insurance Administrator, the first community meeting was held on August 23, 1976. This meeting, attended by representatives of the City of O'Fallon, the FIA, and the U.S. Army Corps of Engineers (COE), was held to explain the nature and purpose of the Flood Insurance Study.

A public notice announcing the beginning of the study and stating its objectives was placed in the local newspaper for a period of three weeks.

On November 26, 1979, the results of the hydrologic and hydraulic analysis were reviewed at an intermediate CCO meeting attended by representatives from the City of O'Fallon, the FIA, and the COE.

On March 18, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the City of O'Fallon, the FIA, and the COE.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of O'Fallon. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through August 1984.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the City of O'Fallon.

Belleau Creek, which flows in a northeasterly direction through the eastern portion of the community was studied in detail from the northern corporate boundary near the Norfolk and Western Railway crossing to the southwest corporate limits. Two Unnamed Tributaries to each Belleau Creek and Peruque Creek were studied by approximate methods within the corporate limits.

2.2 Community Description

The City of O'Fallon is located in central St. Charles County, in eastern Missouri, about eight miles west of the City of St. Charles. It is bordered on the east by the City of St. Peter, and on the west by the City of Lake St. Louis. Nearby communities include the City of St. Paul to the northwest and Wentzville to the west. Transportation routes include Interstate Highway 70 and County Highways AA and M. The Norfolk and Western Railway also runs through the city.

O'Fallon grew by the side of the Old North Missouri railroad. In 1856, the first resident opened a store and in 1912 the city was incorporated. The city was named for Mr. John O'Fallon, a well-known capitalist in St. Louis and a member of the board of directors of the railroad. In the late 1800's, a Catholic convent was opened and served as a school for many years. Today it is known as St. Mary's College.

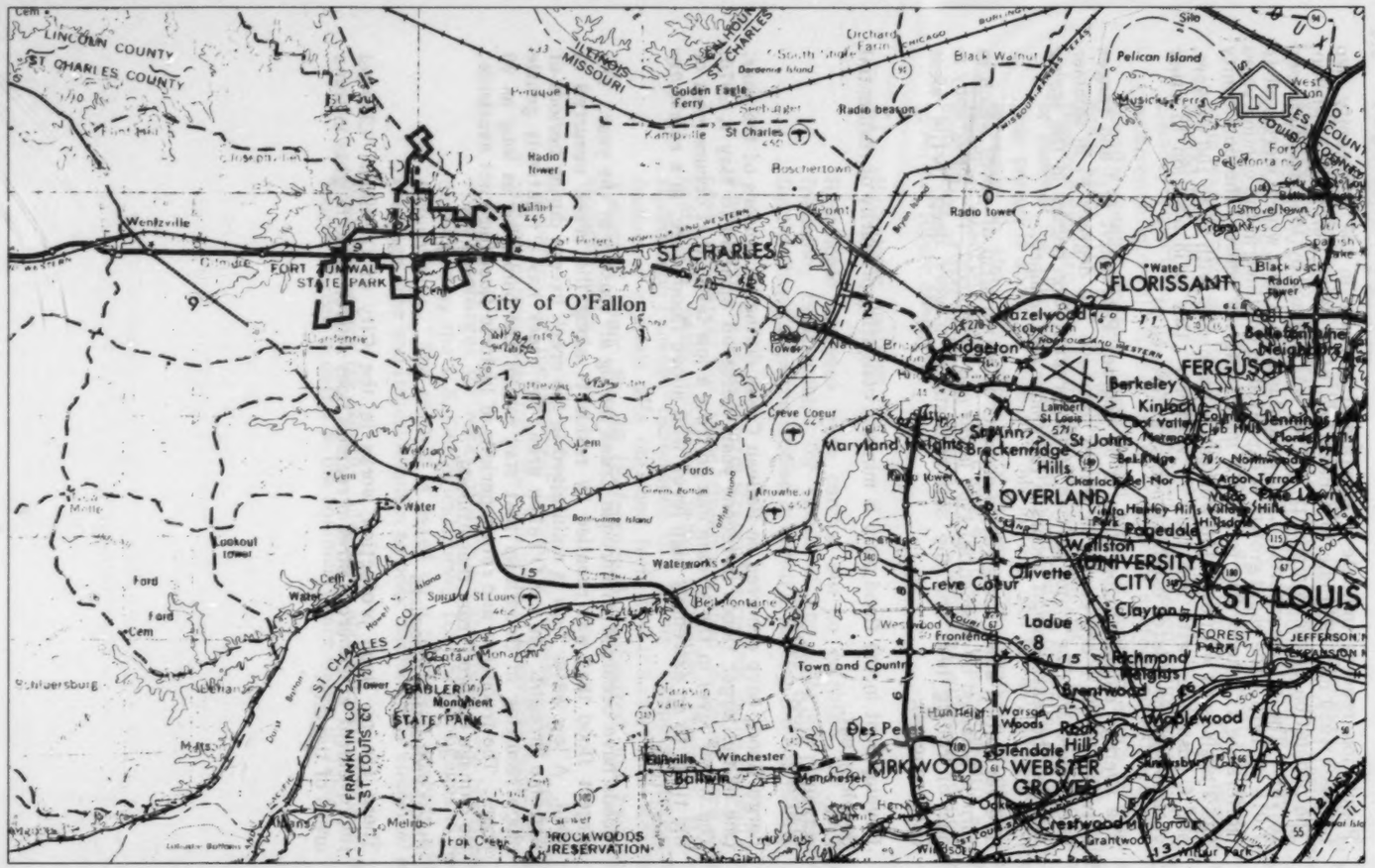

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF O'FALLON, MO
(ST. CHARLES CO.)

APPROXIMATE SCALE
4 0 4 8 12 MILES

VICINITY MAP

Population records indicate a substantial increase in the community size between 1950 and 1960 due to annexations of parts of Dardenne Township. The population of the community in 1940 was 618 and by 1950 had increased to 789. The city numbered 3,770 inhabitants in 1960, which increased to 7,018 by 1970. The rapid growth is expected to continue in the coming years (Reference 1). According to a 1970 manufacturing census, the community has 3 businesses with over 100 workers, 6 businesses with 25 to 100 workers, and 6 businesses with less than 25 workers. This is in addition to other various service-related establishments (Reference 2).

The average annual temperature is 56 degrees Fahrenheit (F.) and ranges between below 0 degrees F. in winter to above 100 degrees F. in summer (Reference 3). The major portion of the precipitation occurs in the spring months; the least amount occurs in December and January.

The vegetation along the streams consists of a thin strip of woods which in turn is bounded by residential type lawns and farmlands. The topography is one of rolling hills and the soil consists of a very deep fertile loess (Reference 4).

Development in the flood plain is minimal consisting primarily of residential development.

2.3 Principal Flood Problems

Large floods have occurred on Belleau Creek during all seasons of the year. One of the larger floods in recent years occurred April 30 to May 1, 1970. The water level in the stream can go from a low level, that occurs most of the time, to an extremely high level, well above flood stage, in a relatively short time.

Floods have occurred on Peruque Creek during all seasons of the year. The largest flood that was recalled by residents along the creek occurred in 1946. A low water flow is maintained in the creek except during periods of extreme drought. In the O'Fallon area, the creek has a relatively gentle slope resulting in floodflows that stay out of the banks for as long as 20 hours. The frequency and return periods of historic floods are not available. No damage occured from these floods.

2.4 Flood Protection Measures

There are no flood protection works in the City of O'Fallon. Channel improvement in numerous stream reaches does reduce flood heights in some areas of the city.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail affecting the community.

Since there are no long-term streamflow records in the Belleau Creek Basin, peak discharges for those streams studied in detail were developed by hydrologic basin modeling using Computer Program HEC-1 "Flood Hydrograph Package" (Reference 5). This computer program utilizes frequency rainfall data obtained from the U.S. National Weather Service Technical Paper No. 40 (Reference 6), optimized unit hydrographs, and storage routing.

Discharges for the 500-year floods for Belleau Creek were obtained with rainfall extrapolated from that published in Technical Paper No. 40.

Flood discharges for areas of approximate study were based on equations developed by the U.S. Geological Survey (USGS) from gages in the St. Louis County area. The method is based on a regression analysis which relates drainage area and imperviousness to peak discharge by empirical equations.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of the flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BELLEAU CREEK					
Norfolk and Western Railway	7.05	2,242	3,091	3,443	5,698
County Highway "K"	3.71	1,471	2,028	2,257	3,595

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along the flooding source studied in detail.

Cross sections for the backwater analyses of Belleau Creek were obtained by field survey, the extent of the cross sections were determined during the field inspections by hydraulic engineers. All bridges and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations, were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the main channels of Belleau Creek range from 0.060 to 0.065. Roughness values for the overbank areas ranged from 0.055 to 0.080.

The starting water-surface elevation for Belleau Creek was determined using the slope-area method. Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step bakcwater computer program (Reference 7). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The 100-year flood elevation for Peruque Creek was taken from a Flood Plain Information report (Reference °). The elevation for the Unnamed Tributary to Belleau Creek were determined from normal depth calculation and topographic maps (Reference 9).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps photoenlarged to a scale of 1:6000 with a contour interval of 10 feet (Reference 9).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated for selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

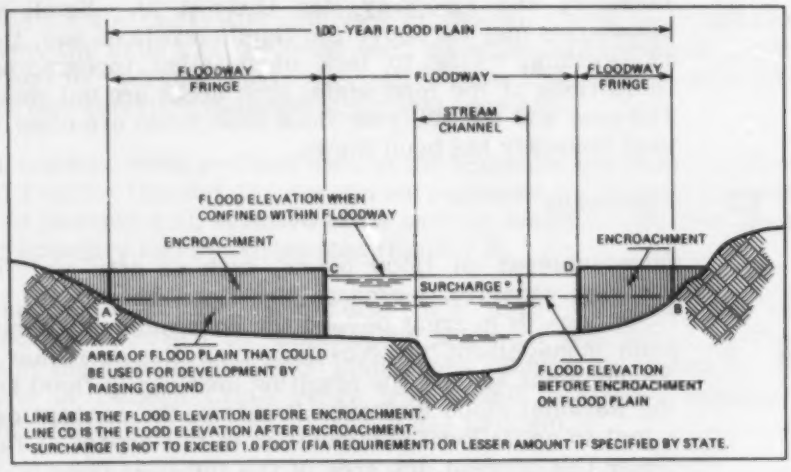
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the City of O'Fallon.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
BELLEAU CREEK								
A	10.745	184	961	3.6	461.7	461.7	462.7	1.0
B	11.020	165	1014	3.4	464.4	464.4	465.4	1.0
C	11.440	63	511	6.7	467.9	467.9	468.9	1.0
D	11.490	283	1007	3.4	469.4	469.4	470.0	0.6
E	11.520	75	531	6.5	470.2	470.2	470.7	0.5
F	11.532	99	614	5.6	470.7	470.7	471.1	0.4
G	12.617	264	1027	3.4	480.0	480.0	481.0	1.0
H	13.614	30	313	7.2	505.9	505.9	506.5	0.6
I	14.267	150[2]	621	3.0	521.4	521.4	522.3	0.9

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF O'FALLON, MO
(ST. CHARLES CO.)

FLOODWAY DATA

BELLEAU CREEK

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the City of O'Fallon are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of O'Fallon was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.

Zone A2:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of O'Fallon is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Insurance Study has been completed for the community of St. Peters (Reference 10). A Flood Insurance Study has also been completed for the unincorporated areas of St. Charles County (Reference 11). The results of the O'Fallon study are in agreement with the other studies.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 12). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
BELLEAU CREEK REACH 1	0003	–1.1	–0.3	1.4	010	A2	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF O'FALLON, MO
(ST. CHARLES CO.)

FLOOD INSURANCE ZONE DATA

BELLEAU CREEK

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 911 Walnut Street, Kansas City, Missouri 64106.

8.0 REFERENCES AND BIBLIOGRAPHY

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8. ----------, Flood Plain Information, Peruque Creek, St. Charles County, Missouri, July 1973.

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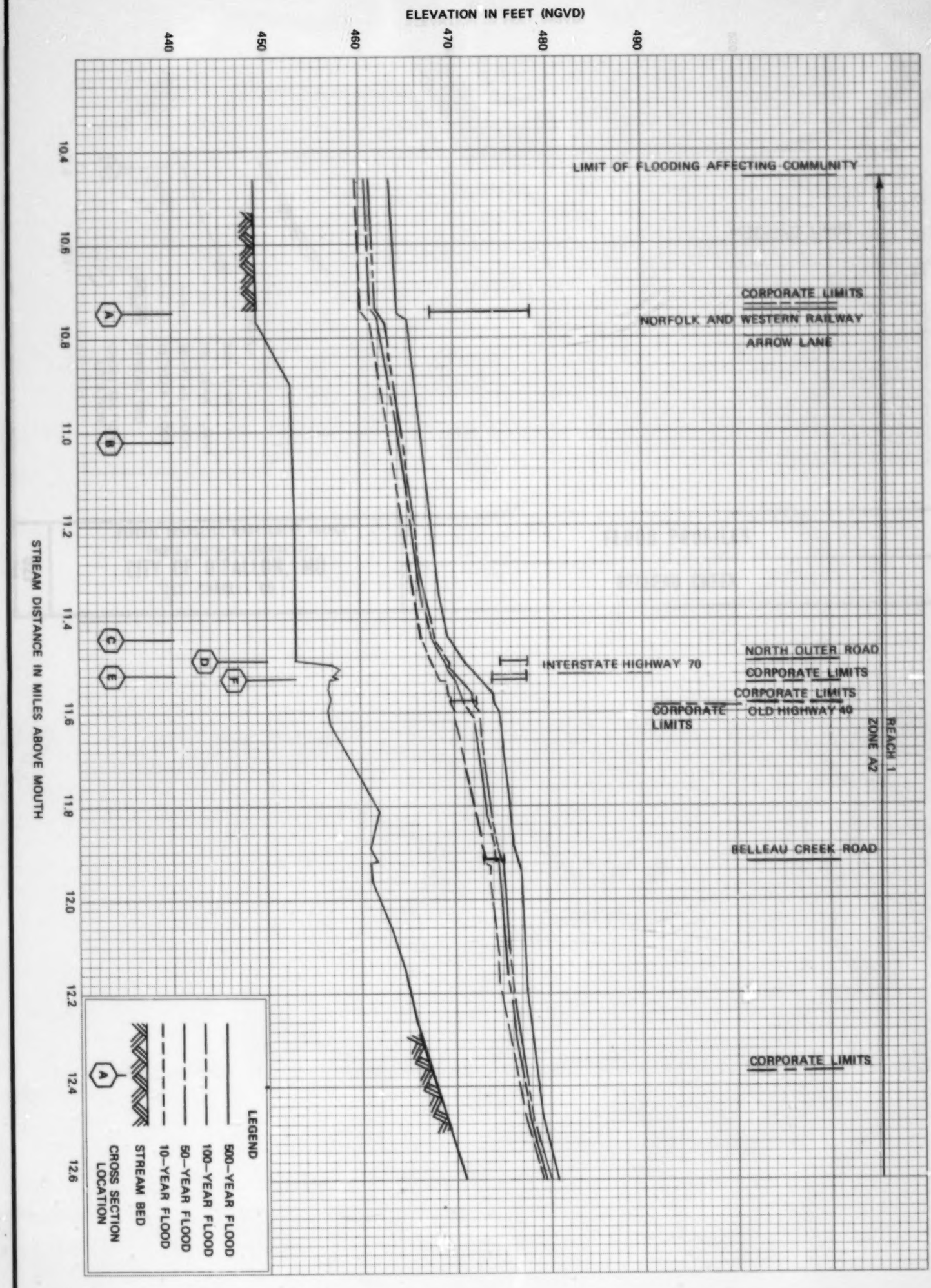
10. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of St. Peters, Missouri, September 1978.

11. ----------, Flood Insurance Study, Unincorporated Areas of St. Charles County, Missouri, May 1979.

12. ----------, Flood Hazard Boundary Map, City of O'Fallon, Missouri, December 1974.

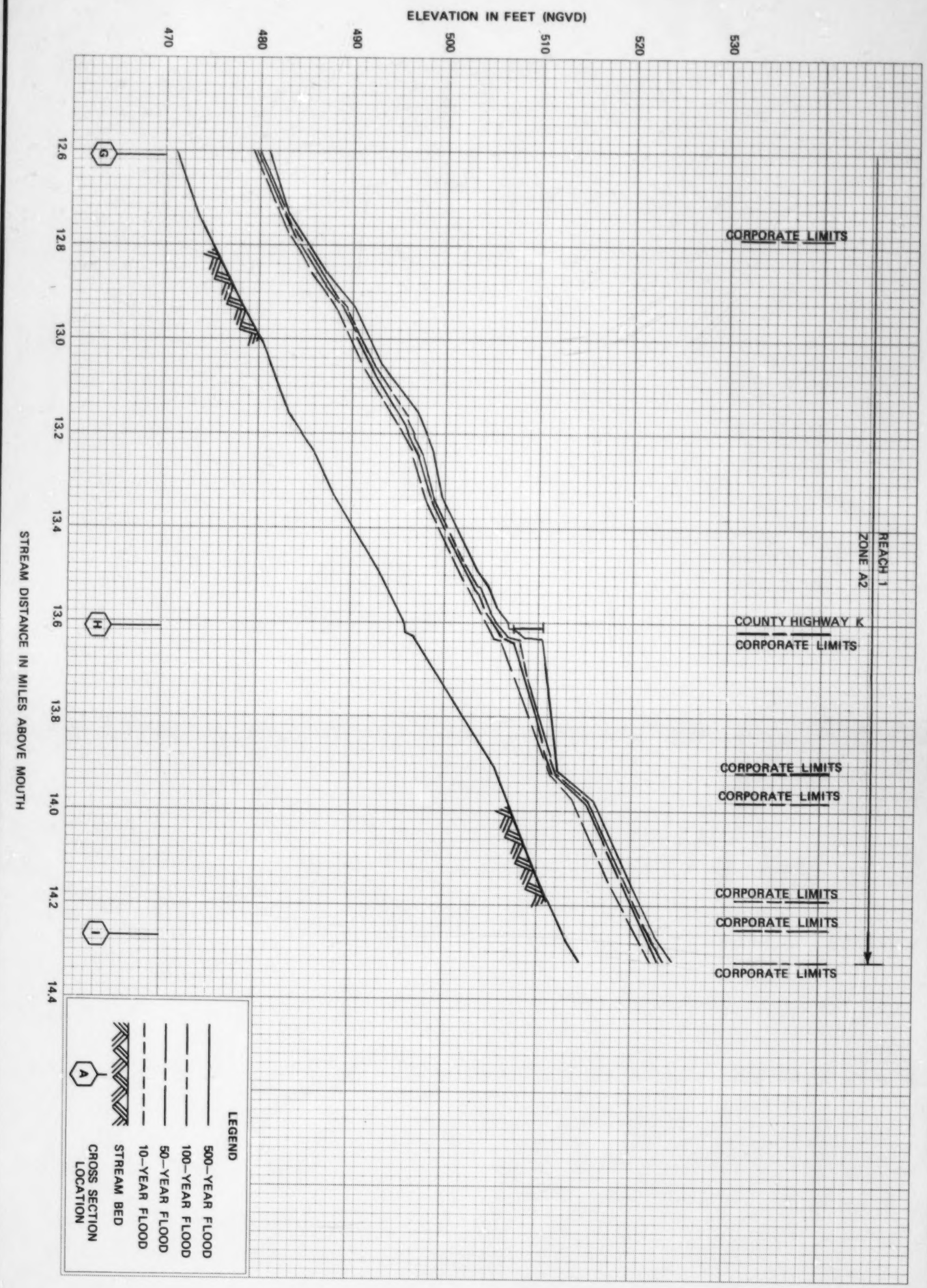


01P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF O'FALLON, MO
(ST. CHARLES CO.)

FLOOD PROFILES

BELLEAU CREEK



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FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF O'FALLON, MO
(ST. CHARLES CO.)

FLOOD PROFILES

BELLEAU CREEK